

# CHAPTER 5

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## CHAPTER 5 *Plotting CDMS data in Python*

### 5.1 Overview

Data read via the CDMS Python interface can be plotted using the **vcs** module. This module, part of the Climate Data Analysis Tool (CDAT) is documented in the CDAT reference manual. The **vcs** module provides access to the functionality of the VCS visualization program.

Examples of plotting data accessed from CDMS are given below, as well as documentation for the **plot** routine keywords.

### 5.2 Examples

In the following examples, it is assumed that variable **psl** is dimensioned (time, latitude, longitude). **psl** is contained in the dataset named '**sample.xml**'.

#### 5.2.1 Example: plotting a gridded variable

```
1 import cdms, vcs
2 #
3 f = cdms.open('sample.xml')
4 psl = f.variables['psl']
5 sample = psl[0]
6 w=vcs.init()
7 #
8 w.plot(sample)
9 f.close()
```

Notes:

#### Line Notes

5 Get a horizontal slice, for the first timepoint.

6 Create a VCS Canvas **w**.

8 Plot the data. Because **sample** is a transient variable, it encapsulates all the time, latitude, longitude, and attribute information.

9 Close the file. This must be done after the reference to the persistent variable '**psl**'.

Thats it! The axis coordinates, variable name, description, units, etc. are obtained from variable **sample**.

What if the units are not explicitly defined for **psl**, or a different description is desired? **plot** has a number of other keywords which fill in the extra plot information.

### 5.2.2 Example: using plot keywords.

```
w.plot(array, units='mm/day', file_comment='High-frequency
reanalysis', long_name='Sea level pressure', comment1='Sample
plot', hms='18:00:00', ymd='1978/01/01')
```

Note: Keyword arguments can be listed in any order.

### 5.2.3 Example: plotting a time–latitude slice

Assuming that variable **psl** has domain (time,latitude,longitude), this example selects and plots a time–latitude slice:

```
1 samp = psl[:, :, 0]
2 w = vcs.init()
3 w.plot(samp, name='sea level pressure')
```

Notes:

#### Line Notes

1 **samp** is a slice of **psl**, at index 0 of the last dimension. Since **samp** was obtained from the slice operator, it is a transient variable, which includes the latitude and time information.

3 The **name** keyword defines the identifier, by default the name in the file.

### 5.2.4 Example: plotting subsetted data

Calling the variable **psl** as a function reads a subset of the variable. The result variable **samp** can be plotted directly:

```
...
1 samp = psl(time=(0.0,100.0), longitude=180.0)
2 w = vcs.init()
3 w.plot(samp)
```

## 5.3 *plot method*

The **plot** method is documented in the CDAT Reference Manual. This

section augments the documentation with a description of the optional keyword arguments.

The general form of the plot command is:[ch4\\_cdms\\_4.0.html/#4.1\\_Overview](http://cdms4.0.html/#4.1_Overview)

```
canvas.plot(array [, args] [,key=value [, key=value [, ...] ] ])
```

where:

- *canvas* is a VCS Canvas object, created with the **vcs.init** method.
- *array* is a variable, masked array, or Numeric array having between two and five dimensions. The last dimensions of the array is termed the 'x' dimension, the next-to-last the 'y' dimension, then 'z', 't', and 'w'. For example, if *array* is three-dimensional, the axes are (z,y,x), and if *array* is four-dimensional, the axes are (t,z,y,x). (Note that the t dimension need have no connection with time; any spatial axis can be mapped to any plot dimension. For a graphics method which is two-dimensional, such as boxfill, the y-axis is plotted on the horizontal, and the x-axis on the vertical.

If array is a gridded variable on a rectangular grid, the plot function uses a box-fill graphics method. If it is non-rectangular, the meshfill graphics method is used.

Note that some plot keywords apply only to rectangular grids only.

- *args* are optional positional arguments:

*args := template\_name, graphics\_method, graphics\_name*

*template\_name*: the name of the VCS template (e.g., 'AMIP')

*graphics\_method* : the VCS graphics method (boxfill)

*graphics\_name*: the name of the specific graphics method ('default')

See the CDAT Reference Manual and VCS Reference Manual for a detailed description of these arguments.

- *key=value, ...* are optional keyword/value pairs, listed in any order. These are defined in Table 5.1 on page 145.

Table 5.1 plot keywords

key	type	value
comment1	string	Comment plotted above file_comment
comment2	string	Comment plotted above comment1
comment3	string	Comment plotted above comment2
continents	0 or 1	if ==1, plot continental outlines (default:plot if xaxis is longitude, yaxis is latitude –or– xname is 'longitude' and yname is 'latitude')
file_comment	string	Comment, defaults to variable.parent.comment)
grid	CDMS grid object	Grid associated with the data. Defaults to variable.getGrid()
hms	string	Hour, minute, second
long_name	string	Descriptive variable name, defaults to variable.long_name.
missing_value	same type as array	Missing data value, defaults to variable.getMissing()
name	string	Variable name, defaults to variable.id
time	cdtime relative or absolute time	time associated with the data. Example: cdtime.reltime(30.0, "days since 1978-1-1").
units	string	Data units. Defaults to variable.units

variable	CDMS variable object	Variable associated with the data. The variable grid must have the same shape as the data array.
xarray ([ylzltlw] array)	1-D Numeric array	[rectangular grids only] Array of coordinate values, having the same length as the corresponding dimension. Defaults to xaxis[:] (ylzltlwaxis[:])
xaxis ([ylzltlw] axis)	CDMS axis object	[rectangular grids only] Axis object. xaxis defaults to grid.getAxis(0), yaxis defaults to grid.getAxis(1)
xbounds (ybounds)	2-D Numeric array	[rectangular grids only] Boundary array of shape (n,2) where n is the axis length. Defaults to xaxis.getBounds(), or xaxis.genGenericBounds() if None, similarly for ybounds.
xname ([ylzltlw]name)	string	[rectangular grids only] Axis name. Defaults to xaxis.id ([ylzltlw]axis.id)
xrev (yrev)	0 or 1	If xrev (yrev) is 1, reverse the direction of the x-axis (y-axis). Defaults to 0, with the following exceptions: * If the y-axis is latitude, and has decreasing values, yrev defaults to 1 * If the y-axis is a vertical level, and has increasing pressure levels, yrev defaults to 1.
xunits ([ylzltlw] units)	string	[rectangular grids only] Axis units. Defaults to xaxis.units ([ylzltlw]axis.units).

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